(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: 0 194 764 A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: 86301074.0

(22) Date of filing: 17.02.86

(51) Int. Cl.[4]: C 07 C 103/30
C 07 D 307/79, C 07 D 333/24
C 07 D 333/60, C 07 D 317/32
C 07 D 311/74, C 07 C 121/43
A 01 N 37/18, A 01 N 45/00
A 01 N 43/12, A 01 N 43/10

(30) Priority: 18.02.85 GB 8504097
25.02.85 GB 8504825

(43) Date of publication of application:
17.09.86 Bulletin 86/38

(84) Designated Contracting States:
AT BE CH DE FR GB IT LI LU NL SE

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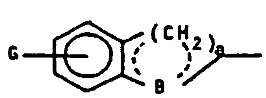
(54) Pesticidal compounds.

(57) Compounds of Formula (I):

$$Ar(CH_2)_n(CR^2{=}CR^3)_2C(=O)NRR^1 \qquad (I)$$

wherein:
Ar is phenyl, naphthyl, thienyl, fluorenyl, phenanthrenyl, dibenzo furanyl or a polynuclear group (A):



in which a is 0, 1 or 2; B is $(D)_b(CH_2)_c(E)_e$ where each of D and E is oxygen or sulphur, b and e are independently 0 or 1 but not both 1, and c is 0, 1, 2 or 3, the sum of a,b,c and e being at least 3, and the ring containing B is wholly or partially saturated; and G is hydrogen or a benzene ring fused to the benzene ring of group (A);

any of the groups Ar may be substituted by one or more of C_{1-4} alkyl, halo-(C_{1-4}) alkyl, halo, C_{1-4} alkoxy (except 3,4-methylenedioxy) or C_{1-4} halo -alkoxy; n is 1 to 8, except that n is 1 to 4 when Ar is phenyl or substituted phenyl;

each of R^2 and R^3 is in each case independently hydrogen, C_{1-4} alkyl or halo-(C_{1-4}) alkyl; and R and R^1 are each selected from hydrogen, alkyl, cycloalkyl, alkenyl or alkoxy (any of which may be substituted by halo, alkenyl, alkyl, cycloalkyl, alkoxy, alkynyl or cyano) are insecticidal and acaricidal.

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Pestlcidal Compounds

This invention relates to pesticidal compounds.

European patent publication No 111 105 discloses a class of w-phenyl unsaturated amide compounds as insecticides, all of these compounds having an unsaturated bond conjugated to the phenyl ring. The same document also discloses a larger class of related compounds, stated to have any 5- or 6-membered aromatic ring in the w-position and without being limited to compounds having an unsaturated bond conjugated to the aromatic ring. However, these compounds are disclosed only as acaricides. We have now found that insecticidal activity is found in compounds without conjugation to the aromatic group, and also that pesticidal activity is found in compounds having aromatic or partially aromatic groups with more than 5 or 6 members.

Meisters and Wailes (Aust. J. Chem. (1966), 19, 1215) disclose N-isobutyl (2E,4E)-7-phenylhepta-2,4-dienamide but assert that it had no insecticidal activity against Musca domestica at up to 100% concentration. Vig et al (J. Indian Chem. Soc. 1974, 51(9), 817) disclose piperovatine (N-isobutyl 6-(4-methoxyphenyl)-hexa-2,4-dienamide) but do not mention any insecticidal activity.

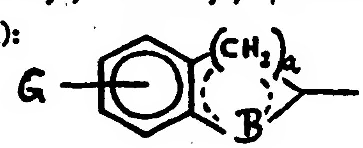
Japanese patent application No. 57/212, 150 discloses certain w-phenyl deca-, undeca- and dodecadienamides as insecticides.

European patent publication No. 142 593, having an earliest priority date of 21st November 1983 and a publication date of 6th June 1985, discloses unsaturated amide pesticides having an w-aromatic group which is polynuclear. All of the compounds which are specifically disclosed have polynuclear systems which are entirely aromatic.

The invention provides compounds of Formula (I):

$$Ar\,(CH_2)_n\,(CR^2{=}CR^3)_2\,\overset{O}{\overset{\|}{C}}\,NRR^1 \qquad (I)$$

wherein: Ar is phenyl, naphthyl, thienyl, fluorenyl, phenanthrenyl, dibenzofuranyl or a polynuclear group (A):



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in which a is 0, 1 or 2; B is $(D)_b(CH_2)_c(E)_e$ where each of D and E is oxygen or sulphur, b and e are independently 0 or 1 but not both 1, and c is 0, 1, 2 or 3, the sum of a, b, c and e being at least 2, and the ring containing B is wholly or partially saturated; and G is hydrogen or a benzene ring fused to the benzene ring of group (A);

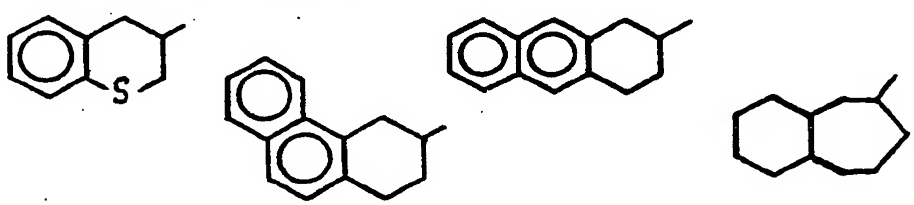
any of the groups Ar may be substituted by one or more of C_{1-4} alkyl, halo-(C_{1-4}) alkyl, halo, C_{1-4} alkoxy (except 3,4-methylenedioxy) and halo-$(C_{1-4}$- -alkoxy); n is 1 to 8, except that n is 1 to 4 when Ar is phenyl or substituted phenyl; each of R^2 and R^3 is in each case independently hydrogen, C_{1-4} alkyl or halo-(C_{1-4})alkyl; and R and R^1 are each selected from hydrogen, C_{1-6} alkyl, C_{3-6} cycloalkyl, C_{2-6} alkenyl or C_{1-6} alkoxy (any of which may be substituted by halo, C_{2-6} alkenyl, C_{1-6} alkyl, C_{3-6} cycloalkyl, C_{1-6} alkoxy, C_{2-6} alkynyl or cyano) except for the following compounds:

N-isobutyl 7-phenyl hepta-(2F,4E)-dienamide
N-isobutyl 6-phenyl hexa-(2E,4E)-dienamide
N-isobutyl 6-(4-methoxyphenyl)hexa-(2E,4E)-dienamide
N-isobutyl 6-(2-thienyl)hexa-(2E,4E)-dienamide
N-isobutyl 8-phenylocta-(2E,4E)-dienamide
N-isobutyl 6-(1-naphthyl)hexa-(2E,4E)-dienamide

In Formula I, the following features and any and all combinations thereof are preferred:

Preferably, n is odd. Suitably, n is 1, 3 or 5, most preferably 1 or 3. The configuration of both double bonds in the diene group is preferably E.

Preferred groups for Ar include phenyl, furyl, thienyl, naphthyl (especially 2-naphthyl), benzofuranyl, benzopyranyl, chromanyl, indanyl, tetrahydronaphthyl, or any of the following groups:



any of which may be substitut d as above.

Any substitution of a single phenyl ring is preferably at the 3-position and is pr ferably halo (eg fluoro), haloalkyl (eg trifluoromethyl) or alkoxy (eg

methoxy). 3,4-Dihalophenyl is also a preferred value for Ar. When Ar is naphthyl or benzofuranyl, the said $(CH_2)_n$ link is preferably attached at the 1-position.

Trifluoromethyl is particularly preferred. Preferably Ar is 3-trifluoromethylphenyl, particularly when n is 1.

Preferably, R is hydrogen. Suitably, R^1 is alkyl, C_{1-6} being preferred and isobutyl, 1-methylpropyl, 2,2-dimethylpropyl, 1,2,2-trimethylpropyl and 1,2-dimethylpropyl being particularly preferable. It has been found that acaricidal activity is enhanced if there is an alkyl group α to the nitrogen.

R^2 and R^3 are preferably in each case hydrogen.

Compounds of Formula (I), (IA) and (IB) may be prepared in any of the following ways:-

(a) by amidation of the corresponding acid or acid derivative, ie. by reaction of a compound of Formula (II) with a compound of Formula (III):

(II) $Ar\,(CH_2)_n\,(CR^2{=}CR^3)_2\ COZ'$ (III) $HNRR^1$

wherein Z^1 is hydroxyl, halo or a phosphoroimidate ester group ($-\overset{O^-}{\overset{|}{P}}$ (O Aryl) NH aryl) and the other variables are as defined above;

(b) by reaction of a compound of Formula (IV) with a compound of Formula (V) or (VI):

(IV) $Ar\,(CH_2)_n(CR^2{=}CR^3)_p\overset{O}{\overset{\|}{C}}H$

(V) $(Z'')_3\,P{=}CH(CR^2{=}CHR^3)_qC(O)NRR^1$

(VI) $(Z'')_2\underset{O^-}{\underset{|}{P}}{=}CH(CR^2{=}CR^3)_qC(O)NRR^1$.

wherein Z" is alkyl, alkoxy (preferably ethoxy) or aryl (preferably phenyl), and p+q=1. The locations of the aldehyde and the phosphorus containing groups, $(Z'')_3P$ and $(Z'')_2P(O)$, may be swapped to give an exactly analogous r action;

(c) by ß-elimination from a compound of Formula (VII) or (VIII):

(VII) $Ar(CH_2)_n(CR^2{=}CR^3)\overset{X}{C}R^2\overset{Y}{C}R^3C(O)NRR^1$

(VIII) $Ar(CH_2)_n\overset{X}{C}R^2\overset{Y}{C}R^3(CR^2{=}CR^3)C(O)NRR^1$

wherein one of X and Y is hydrogen and the other is a group $Q(\rightarrow O^-)L$, Q is sulphur or selenium and L is a suitable group such as lower alkyl (preferably methyl) or aryl;

(d) by reaction of a compound of Formula (IX) with a compound of Formula (X):-

(IX) $Ar(CH_2)_nCH_2\text{-}Hal$

(X) $R^2C{\equiv}CR^3(CR^2{=}CR^3)C(O)NR^1$

where Hal is a halogen atom, followed by reduction of the triple bond; or

(e) by reacting a compound of Formula (XI) with a compound of Formula (XII):

(XI) $Ar\,(CH_2)_n\,CR^2{=}CR^3\text{-}M$

(XII) $Hal\text{-}(CR^2{=}CR^3)\overset{O}{\overset{\|}{C}}NRR^1$

wherein Hal is halide eg. bromide or iodide and M is a metal atom or metal group, for example comprising zirconium, aluminium or zinc, e.g. a bis-(cyclopentadienyl) zirconium chloride group. Compounds of Formula (XI) may be made with, for example, vinyl-bis-(cyclopentadienyl)zirconium chloride in THF in the presence of a palladium (O) catalyst.

Process (a) is normally carried out in an aprotic solvent, such as ether, dichloromethane or benzene, optionally in the presence of a tertiary amine, such as triethylamine, but in the absence of water. If the compound of Formula (I) is an acid halide, for example acid chloride, then it may be formed from the corresponding acid by reaction with a suitable reagent such as oxalyl chloride or thionyl chloride. When Z' is a phosphoroimidate group then this is suitably formed from (PhO)P(→O)NHPh Cl. The acid, or the acid function in the compound of Formula (II), may be prepared by hydrolysis of an ester, the ester being prepared by a conventional Wittig or Wadsworth-Emmons reaction, using

for example an aldehyde and ethoxycarbonylmethylene triphenylphosphorane or the anion from triethylphosphonocrotonate. This latter reaction may result in an isomeric mixture, for example a (2,4)-hexadienoate and (3,5)-hexadienoate; such a mixture may be reacted as above, and the resulting mixture of amides separated by chromatography or other convenient techniques. When n is 1, hydrolysis of the ester is preferably acidic, for example using aqueous hydrochloric acid and dioxan.

Alternatively, the ester referred to above may be derived by rearrangement and elimination on a compound of Formula (XIII):

$$\text{(XIII)}\quad Ar(CH_2)_{n+2}CR^2{=}C\begin{matrix}\diagup SR^5\\ \diagdown COOR^4\end{matrix}$$

wherein R^5 is any suitable group, such as phenyl, and R^4 is alkyl.

The compound of Formula (XIII) may be obtained by reaction of a compound of Formula (XIV) with a compound of Formula (XV):

$$\text{(XIV)}\quad Ar(CH_2)_{n+2}\overset{O}{\overset{\|}{C}}H$$

$$\text{(XV)}\quad Ph\,S({\to}O)\,CH_2\overset{O}{\overset{\|}{C}}OR^4$$

A further route is for the ester referred to above to be prepared by elimination on a compound of Formula (XVI):

$$\text{(XVI)}\quad Ar(CH_2)_n\text{-}A^1\text{-}A^2\text{-}A^3\text{-}COOR^4$$

wherein R^4 is as defined above, one of A^1, A^2 and A^3 is $(CR^2{=}CR^3)$, another of A^1, A^2 and A^3 is $-CR^2R^3-$, the third of A^1, A^2 and A^3 is $-CR^2(OR^6)-$, R^6 being H or acyl such as acetyl, and the said $-CR^2R^3-$ and $-CR^2(OR^6)-$ groups are adjacent one another. The reaction is preferably carried out in an aromatic solvent, conveniently in the presence of a molybdenum catalyst and a base, such as bis-trimethylsilylacetamide .

Intermediates of Formula (XVI) may be obtained by reaction of a suitable aldehyde with a suitable sulphinyl compound, followed by acylation.

The reaction is carri d out in a suitabl solvent such as acetonitrile with a base such as piperidine.

Process (b) is carried out in a dry solvent, for example tetrahydrofuran, optionally in the presence of a base, and preferably in the absence of oxygen, e.g. under a nitrogen atmosphere, at a low temperature. The Wittig-type reagent may be obtained with lithium diisopropylamide.

Process (c) is normally carried out by heating in an aprotic solvent such as benzene or toluene, preferably in the presence of an acid catalyst, such as paratoluene-sulphonic acid. Process (d) proceeds by reaction of the compound of formula (X) with a base (such as lithium diisopropylamide) and the compound of Formula (IX) in an aprotic solvent such as THF. Process (e) is preferably carried out in an aprotic solvent such as THF, under an inert atmosphere (such as argon) and in the presence of a palladium (O) catalyst, such as bis-(triphenylphosphine) palladium.

The intermediates of Formulae (III) - (XIV) may be prepared by standard methods. For example, the compounds of Formulae (V) and (VI) may be prepared by the reaction of an appropriate phosphine, phosphonate or phosphite with an w-halo amide. Compounds of Formula (IV) may be prepared by hydrolysis of a ketal ring or oxidation of an alcohol.

The carbonyl-containing compounds of Formula (IV) may be prepared by oxidation of the corresponding alcohol, for example using pyridinium chlorochromate or oxalyl chloride/DMSO.

The compounds of Formula (I) may be used to control arthropods such as insect and acarine pests.

The compounds of formula (I) may be used for such purposes by application of the compounds themselves or in diluted form in known fashion as a dip, spray, lacquer, foam, dust, powder, aqueous suspension, paste, gel, shampoo, grease, combustible solid, vapourising mat, wettable powder, granule, aerosol, emulsifiable concentrate, oil suspensions, oil solutions, pressure-pack, impregnated article (such as an ear tag or collar) or pour on formulation. Dip concentrates are not applied per se, but diluted with water and the animals immersed in a dipping bath containing the dip wash. Sprays may be appli d by hand or by means of a spray race or arch. The animal may b saturated with the spray by means of high volume application or superficially coated with the spray by means of light or ultra low volume application. Aqueous suspensions may be applied to the animal in the same manner as sprays or dips. Dusts may

be distributed over the animals by means of a p wder applicator or incorporated in perforat d bags attach d to trees or rubbing bars. Pastes, shampoos and greas s may be applied manually or distribut d over the surface of an inert material against which animals rub and transfer the material to their skins. Pour-on formulations are dispensed as a unit of liquid of small volume on to the backs of animals such that all or most of the liquid is retained on the animals.

The compounds of formula (I) may be formulated either as formulations ready for use on the animals or as formulations requiring dilution prior to application, but both types of formulation comprise a compound of formula (I) in intimate admixture with one or more carriers or diluents. The carriers may be liquid, solid or gaseous or comprise mixtures of such substances, and the compound of formula (I) may be present in a concentration of from 0.025 to 99% w/v depending upon whether the formulation requires further dilution.

Dusts, powder and granules comprise the compound of formula (I) in intimate admixture with a powdered solid inert carrier for example suitable clays, kaolin, talc, mica, chalk, gypsum, vegetable carriers, starch and diatomaceous earths.

Sprays of a compound of formula (I) may comprise a solution in an organic solvent (e.g. those listed below) or an emulsion in water (dip wash or spray wash) prepared in the field from an emulsifiable concentrate (otherwise known as a water miscible oil) which may also be used for dipping purposes. The concentrate preferably comprises a mixture of the active ingredient, with or without an organic solvent and one or more emulsifiers. Solvents may be present within wide limits but preferably in an amount of from 0 to 90% w/v of the composition and may be selected from kerosene, ketones, alcohols, xylene, aromatic naphtha, and other solvents known in the formulating art. The concentration of emulsifiers may be varied within wide limits but is preferably in the range of 5 to 25% w/v and the emulsifiers are conveniently non-ionic surface active agents including polyoxyalkylene esters of alkyl phenols and polyoxyethylene derivatives of hexitol anhydrides and anionic surface active agents including Na lauryl sulphate, fatty alcohol ether sulphates, Na and Ca salts of alkyl aryl sulphonates and alkyl sulphosuccinates.

Wettable powders comprise an inert solid carrier, one or mor surface active agents, and optionally stabilisers and/or anti-oxidants.

Emulsifiable concentrates comprise emulsifying agents, and often an organic solvent, such as kerosene, ketones, alcohols, xylenes, aromatic naphtha, and other solvents known in the art.

Wettable powders and emulsifiable concentrates will normally contain from 5 to 95% by weight of the active ingredient, and are diluted, for example with water, before use.

Lacquers comprise a solution of the active ingredient in an organic solvent, together with a resin, and optionally a plasticiser.

Dip washes may be prepared not only from emulsifiable concentrates but also from wettable powders, soap based dips and aqueous suspensions comprising a compound of formula (I) in intimate admixture with a dispersing agent and one or more surface active agents.

Aqueous suspensions of a compound of formula (I) may comprise a suspension in water together with suspending, stabilizing or other agents. Aqueous solutions may also be formed from acid addition salts of a compound of the formula (I). The suspensions or solutions may be applied per se or in a diluted form in known fashion.

Greases (or ointments) may be prepared from vegetable oils, synthetic esters of fatty acids or wool fat together with an inert base such as soft paraffin. A compound of formula (I) is preferably distributed uniformly through the mixture in solution or suspension. Greases may also be made from emulsifiable concentrates by diluting then with an ointment base.

Pastes and shampoos are also semi-solid preparations in which a compound of formula (I) may be present as an uniform dispersion in a suitable base such as soft or liquid paraffin or made on a non-greasy basis with glycerin, mucilage or a suitable soap. As greases, shampoos and pastes are usually applied without further dilution they should contain the appropriate percentage of the compound of formula (I) required for treatment.

Aerosol sprays may be prepar d as a simple solution of the active ingredient in the aerosol propellant and co-solvent such as halogenated alkanes and the solvents ref rred to above, resp ctively. Pour-on formulations may be made as a soluti n or suspension of a compound of formula (I) in a liquid medium which also contains a viscous oil to minimise spreading of the formulation on the

surface of the animals. An avian or mammal host may also be protected against inf station of Acarine ectoparasites by means of carrying a suitably-moulded, shaped plastics article impregnated with a compound of formula (I). Such articles include impregnated collars, tags, bands, sheets and strips suitably attached to appropriate parts of the body.

The concentration of the compound of formula (I) to be applied to an animal will vary according to the compound chosen, the interval between treatments, the nature of the formulation and the likely infestation, but in general 0.001 to 20.0% w/v and preferably 0.01 to 10% of the compound should be present in the applied formulation. The amount of the compound deposited on an animal will vary according to the method of application, size of the animal, concentration of the compound in the applied formulation, factor by which the formulation is diluted and the nature of the formulation but in general will lie in the range of from 0.0001% to 0.5% except for undiluted formulations such as pour-on formulations which in general will be deposited at a concentration in the range from 0.1 to 20.0% and preferably 0.1 to 10%.

Dusts, greases, pastes and aerosol formulations are usually applied in a random fashion as described above and concentrations of 0.001 to 20% w/v of a compound of formula (I) in the applied formulation may be used.

Insect pests include members of the orders Coleoptera (e.g. Anobium, Tribolium, Sitophilus, Diabrotica, Anthonomus or Anthrenus spp.), Lepidoptera (e.g. Ephestia, Plutella, Chilo, Heliothis, Spodoptera or Tineola spp.), Diptera (e.g. Musca, Aedes, Culex, Glossina, Stomoxys, Haematobia, Tabanus, Hydrotaea, Lucilia, Chrysomia, Callitroga, Dermatobia, Hypoderma, Liriomyza, and Melophagus spp.), Phthiraptera (Malophaga e.g. Damalina spp. and Anoplura e.g. Linognathus and Haematopinus spp.), Hemiptera (e.g. Aphis, Bemisia, Aleurodes, Nilopavata, Nephrotetix or Cimex spp.), Orthoptera (e.g. Schistocerca or Acheta spp.), Dictyoptera (e.g. Blattella, Periplaneta or Blatta spp.), Hymenoptera (e.g. Solenopsis or Monomorium spp.), Isoptera (e.g. Reticulitermes spp.), Siphonaptera (e.g. Ctenocephalides or Pulex spp.), Thysanura (e.g. Lepisma spp.), Dermaptera (e.g. Forficula spp.) and Pscoptera (e.g. Peripsocus spp.).

Acarine p sts include ticks, e.g. members of the genera Boophilus, Rhipicephalus, Amblyomma, Hyalomma, Ixodes, Haemaphysalis, Dermocentor and Anocentor, and mites and manges such as Tetranychus, Psoroptes, Psorergates, Chorioptes and Demodex spp.

The compounds exhibit killing and/or knockdown activity against arthropod pests, and can be used to control larval pests as well as adult pests.

Compounds of the invention may be combined with one or more other active ingredients (for example pyrethroids, carbamates and organophosphates) and/or with attractants and the like. Furthermore, it has been found that the activity of the compounds o' the invention may be enhanced by the addition of a synergist or potentiator, for example: one of the oxidase inhibitor class of synergists, such as piperonyl butoxide or NIA 16388; a second compound of the invention; or a pyrethroid pesticidal compound. When an oxidase inhibitor synergist is present in a formula of the invention, the ratio of synergist to compound of formula (I) will be in the range 25:1-1:25 eg about 10:1.

Stabilisers for preventing any chemical degradation which may occur with the compounds of the invention include, for example, antioxidants (such as tocopherols, butylhydroxyanisole and butylhydroxytoluene) and scavengers (such as epichlorhydrin).

It will be understood that what we will claim may comprise:

(a) compounds of Formula (I);
(b) processes for the preparation of compounds of Formula (I);
(c) insecticidal and acaricidal compositions comprising a compound of Formula (I) in admixture with a carrier;
(d) processes for the preparation of such pesticidal compositions;
(e) methods for the control of insect or acarine pests comprising the application to the pest or its environment of a compound of Formula (I);
(f) synergised pesticidal compositions comprising a compound of Formula (I);
(g) potentiating or non-potentiating mixtures of a compound of Formula (I) and another pesticidal compound; and
(h) novel intermediates of the preparation of compounds of Formula (I), especially compounds of Formula (II) and (XI).

The following Examples illustrate, in a non-limiting manner, preferred embodiments of the invention.

Example 1: (2E),(4E)-N-Isobutyl 6-phenyl-2,4-hexadienamid

Tri thylphosphonocrotonate (20.85g, 83 mmol) in tetrahydrofuran (THF) (50ml) was added at -70°C to lithium diisopropylamide (83 mmol) in THF (50ml). The temperature of the mixture was allowed to reach -20°C and recooled to -40°C. Phenylacetaldehyde (10g, 83 mmol) in THF (30ml) was added. The mixture was left overnight at room temperature and worked up in the standard manner. The crude material was purified by column chromatography (silica; 9:1 hexane: ether) to give a yellow oil (10g, 56%) consisting substantially of (2E,4E) ethyl 6-phenyl-2,4-hexadienoate and the 3,5-dienoate.

The mixture of esters (10g), water (40ml), conc. HCl (60ml) and dioxan (200ml) was heated under reflux for 16h. The product was extracted into ether, washed with $NaHCO_3$ and brine, and dried. Solvents were removed to give a crude product, (2E),(4E)-6-phenyl-2,4-hexadienoic acid and (3E,5E)-6-phenyl-3,5-hexadienoic acid (B), which was carried on to the next stage.

Triethylamine (6.4ml, 46.3 mmol) was added to the acids (B) (8.7g, 46.3 mmol) and phenyl N-phenylphosporamidochloridate (12.4g, 46.3 mmol) in dichloromethane (about 50ml) with cooling. The yellow solution was stirred under nitrogen for 1hr at room temperature, and then triethylamine (6.4ml, 46.3 mmol) and isobutylamine (4.6ml, 46.3ml) were added with cooling. After 16hr at room temperature the reaction was worked up with ether. The crude title product was purified, first by column chromatography (silica hexane/ether) then by recrystallisation (6:4 hexane: ethyl acetate) to give colourless needles (1.7g), m.p. 119-20°C. Tlc. Silica/ether, 1 spot Rf 0.46, GC (OV210 200°); retention time 1.3 min.

NMR: 7.16, (6H), m, aryl, H3; 6.20(3H), m, H4, H5, NH; 5.83 (1H), d, H2; 3.48(2H), d, H6; 3.16(2H), d of d, 1.8 (1H), m, 0.95 (6H), d, isobutyl.

EXAMPLE 2: (2E),(4E)-N-isobutyl 6-(3-trifluoromethylphenyl)-2,4-hexadienamide

3-Trifluoromethylbromobenzene (3g, 13.3 mmol), prop-2-yne-1-ol (13.3 mmol) bis-triphenylphosphine palladium chloride (0.2g) and cuprous iodide (80mg) in triethylamine (20ml) were reacted together at room temperature under dry nitrogen for 16hrs. The reaction was worked up and the crude product purified by column chromatography (silica/ether) (3.4g).

Compound (A) (3.4g), 17mmol was subjected to catalytic hydrogenation in ethyl acetate solution in the presence of 5% palladium on charcoal. Hydrog n (820 ml) was taken up, the solution filtered and the solvent removed under r duced pressure to give 3-(3-trifluoromethylphenyl)-propan-1-ol (B) (3.5g), which was used without further purification.

Redistilled oxalyl chloride (1.6ml, 18.33 mmol) in dry dichloromethane (30ml) was cooled to -60°C. Dimethyl sulphoxide (2.85g, 36.6 mmol) was added and, after 10 mins, the alcohol (B) (3.4g, 16.7 mmol) was added. The temperature was held at -60°C for 1.5hrs, and then triethylamine (11.6ml, 84 mmol) was added. The mixture was allowed to reach room temperature and extracted into dichloromethane with washing by aq. HCl, $NaHCO_3$ and brine. The solution was dried and the solvents removed to give 3-(3-trifluoromethylphenyl)-propan-1-al (C) which was used without further purification.

To methyl triphenylphosphonium iodide (5g, 12.4 mmol)in dry THF (30ml) was added n-butyl lithium (7.8 ml at 1.6M, 12.4 mmol) at -20°C. After 1hr, the aldehyde (C) (2.5g, 12.4 mmol) in THF was added. After 18hrs at room temperature under nitrogen, the reaction mixture was worked-up in conventional fashion. The crude material was purified by column chromatography (Silica/hexane) to give, 4-(3'-trifluoromethylphenyl)-but-1-ene (D) (2g, 80%)

To N-isobutyl methylsulphinylacetamide (1.55g, 8.75 mmol) in trifluoroacetic acid (12ml) under nitrogen at 0°C, was added trifluoroacetic anhydride (1.23 ml, 8.75 mmol). After 10 mins the olefin (D) (1.75g, 8.75 mmol) was added. The reaction mixture was left overnight at room temperature and worked-up in conventional fashion. The crude material was purified by column chromatography (Silica, hexane/ether, 1:1) to give (E)-N-isobutyl 6-(3'-trifluoromethylphenyl)-2-methylthio-4-hexenamide (E) (1.06g, 32%).

Compound E (1g, 2.79 mmol) in methanol was treated with sodium periodate (0.57g, 2.65 mmol) in water (18ml) at 0°C. The mixture was left overnight and then filtered, and the filtrate was extracted with chloroform. The organic extracts were dried and the solvent removed. The crude sulphoxide was dissolved in dry toluene (20ml) and heated under r flux for 10hrs. After a standard work-up, flash-column chromatography (silica, 4:1 ther:hexane) gave the title product as a colourless solid (0.2g, 24%), m.p. 133-135°C. Tlc (silica/ether) 1 spot Rf 0.43. Glc (3% OV210 200°) 1 peak. Retention time 1.5 mins.

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NMR spectrum: 7.40 (5H), m, aromatic, H3; 6.08 (3H), m, H4, H5, NH; 5.83 (1H), d, H2; 3.55 (2H), m, H6; 3.18 (2H), d of d, 1.8 (1H)m, 0.95 (6H), d, isobutyl.

EXAMPLE 3 (2E),(4E)-N-isobutyl 6-(3'-fluorophenyl)-2,4-hexadienamide

4-(3-fluorophenyl)-but-3-yne-1-ol (A) was prepared from but-3-yne-1-ol and 3-fluoro-iodobenzene using an analogous sequence to that of Example 2 and was then similarly reacted to give 4-(3-fluorophenyl)-butan-1-ol (B), which in turn gave 4-(3-fluorophenyl)-butan-1-al (C) as in Example 2.

Compound (C) (0.8g, 4.8 mmol), methyl 2-phenylsulphinylacetate (0.61g, 3.2 mmol) and piperidine (0.027g, 0.32 mmol) were reacted in dry acetonitrile (15ml) under nitrogen at $0^{o}C$ for 2 days. Working up gave a crude product which was purified by column chromatography (silica, ether/hexane) to give methyl 2-phenylsulphinyl-6-(3-fluorophenyl)-2-hexenoate (D).
Potassium carbonate (anhydrous, 0.163g, 1.18mmol) was added to a solution of (D) (0.34g, 0.98 mmol) in dry xylene (3ml). After heating to reflux, the mixture was cooled and the solvent evaporated to give a crude product. Flash column chromatography (silica, ether/hexane) gave methyl 6-(3-fluorophenyl)-2,4-hexadienoate, (170mg).

This was treated by the method of Example 1 to give 6-(3-fluorophenyl)-2,4-hexadienoic acid (F), which, also as in Example 1, yielded the title compound (20mg).

Off-white solid m.p. 108-11^{o}; Tlc (silica/ether), 1 spot, Rf 0.38; Glc (3% Ov210 220^{o}), Retention time 1.0 min.
NMR:7.22 (1H), m, H3; 6.90 (4H), m, aromatic; 6.15 (2H), m, H4, H5; 5.78 (H), d, H2; 5.43 (1H), bd, NH; 3.50, (2H), d, H6; 3.16 (2H), d of d, 1.8 (1H),m, 0.92, (6H) d, isobutyl.

Example 4: (2E)-N-Isobutyl 4-phenyl-2-butenamide

Phenylacetaldehyde (1g, 8.33 mmol) was reacted with phosphorane derived from N-isobutyl acetamidotriphenylphosphonium chloride (13mmol) and sodium methoxide (9.17 mmol), in methanol. The crud product was purified by dry column chromatography (silica, ether/hexane).

NMR: 7.23 (5H),m,aryl; 7.0 (1H), d of t, H3; 5.75 (1H), d, H2; 5.63 (1H), bd, NH; 3.54 (2H), d, H4; 3.20 (2H), d of d, 1.8 (1H), m, 0.97 (6H), d, isobutyl.

Example 5: (2E,(4E)-N-Isobutyl 8-(3-trifluoromethylphenyl)-2,4-octadienamide

3-Trifluoromethylbromobenzene (4g, 17.8 mmol) and but-3-yne-1-ol (1.24g 17.8 mmol) were reacted together in the presence of bis-triphenylphosphine palladium dichloride-cuprous iodide, as in Example 2, to give 4-(3-trifluoromethylphenyl)-but-3-yne-1-ol (A) which was subjected to hydrogenation, as in Example 2, to give 4-(3-trifluoromethylphenyl)-butan-1-ol (B). Compound (B) was oxidised, as in Example 2, to give 4-(3-trifluoromethylphenyl)-butan-1-al (C) which (2.2g, 10.18 mmol) was reacted with triethylphosphonocrotonate - lithium diisopropylamide, as in Example 1, to give ethyl 8-(3-trifluoromethylphenyl)-2,4-octadienoate (D).

Compound (D) (1.7g, 5.45 mmol) was hydrolysed with potassium hydroxide (1.67g, 19.07 mmol) in aqueous ethanol at room temperature, under nitrogen. The usual work up afforded 8-(3-trifluoromethylphenyl)-2,4-octadienoic acid (E). Compound (E) was reacted with N-phenylphosphoramidochloridate, triethylamine and isobutylamine as in Example 1, to give (2E),(4E)-N-isobutyl 8-(3-trifluoromethylphenyl)-2,4-octadienamide as a pale yellow solid (230 mg). Tlc (silica/ether), 1 spot Rf 0.44, GC (OV210,230^{o}); retention time 1.0 min.
NMR: 7.39 (4H), m, aryl; 7.20 (1H), m, H3; 6.10 (2H), m, H4,H5; 5.81 (1H), d, H2; 5.8 (1H), bd, NH; 2.75 (2H), t, H8; 1.95 (4H), m, H6, H7; 3.20 (2H), d of d, 0.95 (6H), d, isobutyl.

Example 6: (2E),(4E)-N-isobutyl 6-(2-naphthyl)-2,4-hexadienamide

2-Bromonaphthalene (10g, 48.3 mmol) and but-3-yne-1-ol (3.38g, 48.3 mmol) were reacted together, analogously to Example 2, to give 4-(2-naphthyl)-but-3-yne-1-ol (A) which was hydrogenated, as in Example 2, to give 4-(2-napthyl)-butan-1-ol, oxidised to 4-(2-napthyl)-butan-1-al (C). Compound (C) (1.6g, 8.08 mmol) in dry acetonitrile was added over 1.5h. to a solution of methyl 2-(4-chlorophenyl)sulphinyl acetate (1.78g, 7.68 mmol) and piperidine (0.69g, 8.08 mmol) in dry acetonitrile. After 16h at room temperature, under nitrogen, the reaction was worked up to give, after column chromatography (silica, 8:2 ether: hexane), methyl 4-hydroxy-6-(2-napthyl)-2-hexenoate (1.32g)(D).

Compound (D) (1.32g, 4.89 mmol), acetic anhydride (1.05g, 10.27 mmol) and triethylamine (0.74g, 7.34 mmol) were treated with 4-N,N-dimethyl-aminopyridine (50mg) at 0 C. After several hours at room temperatur , the reaction mixture was worked up and the crude acetate was purified on a silica column to give methyl 4-acetoxy-6-(2-napthyl)-2-hexenoate (1.2g)(E).

Compound (E) (1.2g, 4.05 mmol) in dry toluene (10ml) was heated under reflux, under dry nitrogen, with bis-trimethylsilylacetamide (0.82g 4.05mmol) and molybdenum hexacarbonyl (0.84g, 3.2 mmol) for about 2h. The reaction was worked up and the product purified by flash column chromatography to give methyl-6-(2-napthyl)-2,4-hexadienoate (0.35g) which was hydrolysed, as in Example 1, to give the acid, in turn converted to (2E),(4E) N-isobutyl 6-(2-naphthyl)-2,4-hexadienamide (120mg), m.p. 138-40^{o}; Tlc, silica/ether, Rf 0.40.

NMR: 7.6 (7H,m, aryl; 7.25 (1H), m, H3; 6.25 (2H), m, H4, H5; 5.77 (1H), d, H2; 5.45 (1H), bd, NH; 3.66 (2H), d, H6; 3.18 (2H), d of d, 1.80 (1H), m, 0.93 (6H), d, isobutyl.

Example 7: (2E),(4E) N-Isobutyl 8-(2-benzofuranyl)-2,4-octadienamide

1-Iodophenol (6g, 27.4 mmol) and but-3-yne-1-ol (2.68g, 27.4 mmol) were reacted together over a prolonged period with bis-triphenyl-phosphine palladium dichloride - cuprous iodide in diethylamine to yield 4-(2-benzofuranyl)-butan-1-ol (A).

This compound was taken through to the title compound using a sequence analogous to that in Example 5, yielding 0.43g. GC (OV210 at 250^{o}), retention time 1.5 mins.

NMR:7.20, (5H), m, aryl, H3; 6.37 (1H), s, benzofuran H3; 6.18 (2H), m, H4, H5; 5.78 (1H), d, H2; 5.6 (1H), bd, NH; 2.08 (4H), m, H6, H7,; 2.78 (2H), t, H8; 3.21 (2H), d of d, 0.95 (6H) d, isobutyl.

Examples 8 to 89

By analogous methods, the compounds listed in Table 1 and Table 2 were made. In all the compounds, the configuration of the double bonds conjugated to the amide carbonyl was E.

Table 1

Ar $(CH_2)_n$ $(CH{=}CH)_m$ CONHR

Example No.	Ar	n	m	R	Preparation as Example No.
8.	Ph	1	2	1,2-dimethylpropyl	1
9.	Ph	1	2	2-methoxypropyl	1
10.	Ph	1	2	2-methylprop-2-ene	1
11.	Ph	3	1	isobutyl	4
12.	Ph	3	2	isobutyl	5
13.	Ph	3	2	sec-butyl	5
14.	Ph	3	2	1,2-dimethylpropyl	5
15.	Ph	3	2	1-cyano-2-methylpropyl	5
16.	Ph	3	2	cyclohexyl	5
17.	3-Trifluoromethyl-phenyl	2	2	isobutyl	5
18.	3-Trifluoromethyl-phenyl	3	2	1,2-dimethyl-propyl	5
19.	3-trifluoromethyl-phenyl	3	2	2-methylpropyl	5

Exampl No.	Ar	n	m	R	Preparation as Example No.
20.	3,5-bis-trifluoro-methylphenyl	3	2	isobutyl	5
21.	3,5-bis-trifluoro-methylphenyl	3	2	1,2-dimethylpropyl	5
22.	3-Fluorophenyl	2	2	isobutyl	5
23.	3-Fluorophenyl	3	2	isobutyl	5
24.	3-Fluorophenyl	3	2	1,2-dimethylpropyl	5
25.	3,5-Dichlorophenyl	3	2	1,2-dimethylpropyl	5
26.	3,5-Dichlorophenyl	7	2	4-methylpentyl	5
27.	2-Naphthyl	3	2	isobutyl	5
28.	2-Naphthyl	3	2	1,2-dimethylpropyl	5
29.	2-Naphthyl	1	1	isobutyl	4
30.	1-Indenyl	2	1	isobutyl	4
31.	2-Thienyl	3	2	isobutyl	5
32.	2-Thienyl	3	2	1,2-dimethylpropyl	5
33.	2-Benzofuranyl	3	2	1,2-dimethylpropyl	7
34.	2-Benzofuranyl	6	2	isobutyl	7

Example No.	Ar	n	m	R	Preparation as Example No.
35.	3,5-bis-trifluoro-methylphenyl	1	2	isobutyl	2
36.	4-methoxyphenyl	1	2	isobutyl	6
37.	4-methoxyphenyl	1	2	2-methoxypropyl	6
38.	phenyl	1	2	2-methyl-2-methoxy propyl	1
39.	2-naphthyl	1	2	1,2-dimethylpropyl	6
40.	2-naphthyl	1	2	2-methoxypropyl	6
41.	3-methoxyphenyl	1	2	isobutyl	6
42.	3-methoxyphenyl	1	2	1,2-dimethylpropyl	6
43.	pentafluorophenyl	3	2	isobutyl	5
44.	phenyl	3	2	dimethylcyclo-propyl	5
45.	phenyl	3	2	1,2,2-trimethyl propyl	5
46.	phenyl	3	2	1-ethyl-propyl	5
47.	phenyl	3	2	3:1, R(-):S(+) 1,2-dimethyl propyl	5
48.	phenyl	3	2	3:1,S(+):R(-) 1,2-dimethylpropyl	5

Exampl N.	Ar	n	m	R	Preparation as Example No.
49.	phenyl	3	2	1-methoxy-2-methyl propyl	5**
50.	3-methoxyphenyl	3	2	1,2-dimethyl propyl	5
51.	4-bromophenyl	3	2	1,2-dimethylpropyl	5
52.	4-bromophenyl	3	2	1,2-dimethylpropyl	5
53.	4-bromophenyl	3	2	1,2,2-trimethyl propyl	5
54.	3,4-dichlorophenyl	3	2	1,2-dimethylpropyl	5
55.	3,4-dichlorophenyl	3	2	1,2,2-trimethyl propyl	5
56.	1-Naphthyl	4	2	1,2-dimethylpropyl	5
57.	1-Naphthyl	4	2	1,2,2-trimethyl propyl	5
58.	phenyl	3	2	1-fluoromethyl-2-methylpropyl	5
59.	phenyl	3	2	1-ethynyl-2-methyl propyl	5
60.	3-[O(CH$_2$)OPh]Ph	1	2	isobutyl	6
61.	3-[O(CH$_2$)$_2$OMe]Ph	1	2	isobutyl	6

Example No.	Ar	n	m	R	Preparation as Example No.
62.	3-[O(CH$_2$)$_2$OMe]Ph	3	2	isobutyl	5
63.	3-[O(CH$_2$)$_2$OMe]Ph	3	2	1,2-dimethylpropyl	5
64.	2-Benzofuranyl	5	2	isobutyl	
65.	2-Benzofuranyl	4	2	isobutyl	
66.	2-Benzofuranyl	4	2	1,2-dimethylpropyl	
67.	2-Benzofuranyl	4	2	2-methoxypropyl	
68.	2-Benzofuranyl	5	2	1,2-dimethylpropyl	
69.	2-Benzofuranyl	2	2	isobutyl	
70.	2-Benzofuranyl	2	2	1,2-dimethylpropyl	
71.	Phenyl	3	2	1-methyl-2-methoxypropyl	
72.	2-Thianaphthenyl	6	2	isobutyl	
73.	2-Thianaphthenyl	6	2	1,2-dimethylpropyl	
74.	Phenyl	3	2	[2-(1,3-dioxalano)]-methyl	
75.	1-Naphthyl	5	2	1,2-dimethylpropyl	
76.	Phenyl	3	2	1-ethyl-2-methyl-propyl	
77.	Phenyl	3	2	cycl pentylmethyl	
77A.	3-trifluor methyl phenyl	1	2	2-methoxypropyl	

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Example 78 (2E,4E) N-Isobutyl 6-(1,2,3,4-tetrahydronaphtha-2-yl)hexa-2,4-dienamide

Sodium (1.53g) was reacted with diethylmalonate (10.99g) in anhydrous ethanol (150 ml) and 2-bromo-1-tetralone (15g) (prepared by standard literature methods) was added at room temperature. The reaction mixture was heated under reflux for 2 hours under nitrogen. The ethanol was removed, the residue diluted with water and the aqueous mixture partitioned with ether and worked up in standard fashion to give an oil.

The product from above was dissolved in glacial acetic acid (225 ml) and treated with conc. hydrochloric acid (225 ml) and water (90 ml). After heating under reflux for 10 hours and allowing to cool, the mixture was partitioned between water and ether and worked up in standard fashion to give crude product acid.

The above acid (13g) in toluene (100 ml) was treated with amalgamated zinc, prepared from zinc powder (100g) and mercurous chloride (10g). The mixture was heated to reflux and conc. hydrochloric acid (140 ml) added in 2 portions. After heating under reflux for 7 hours, the mixture was worked up in standard fashion to give 1,2,3,4-tetrahydronaphtha-2-yl acetic acid.

Sodium borohydride (1.63 g) in dry tetrahydrofuran (70 ml) was added to the above acid (7.6g) in dry THF (20 ml). After 10 mins boron trifluoride etherate (8.52g) was added and the whole stirred for 18 hrs. at room temperature under nitrogen. The reaction mixture was poured onto ice-hydrochloric acid and worked up in the standard manner to give a crude product which was purified by column chromatography to give 1,2,3,4-tetrahydronaphtha-2-yl ethanol.

The previous alcohol (4.3g) was subjected to Swern oxidation as described previously using oxalyl chloride (2.35 ml), dimethylsulphoxide (3.8 ml) and triethylamine (16.95 ml) in dichloromethane to give 1,2,3,4-tetrahydronaphtha-2-yl ethanal.

The aldehyde (4g) was treated with the anion derived from triethyl phosphonocrotonate (5.75g) and lithium diisopropylamid (22.99 mmol) in tetrahydrofuran as in previous exampl s. The crude product was purified by column chromatography (silica: ether-hexane) to give an ester (3.65g) which was

hydrolysed by aqueous hydrochloric acid/dioxane to give 6-(1,2,3,4-tetrahydronaphtha-2-yl) hexa-2,4-dienoic acid.

The above acid (0.4g) was reacted with phenyl N-phenylphosphoramidochloridate (0.44g), isobutylamine (0.165 ml) and triethylamine (2 x 0.23 ml) in dichloromethane as in previous examples. After purification, (2E,4E) N-isobutyl 6-(1,2,3,4-tetrahydronaphtha-2-yl) hexa-2,4-dienamide was obtained as a colourless solid. m.p. 122°; Tlc: (Silica-ether), 1 spot, R_f0.43; NMR : 7.03 (5H), M, aryl, H3; 6.10 (2H),m,H4,5; 5.76 (1H),d,H2; 3.23 (2H),d of d; 0.94(6H),d,isobutyl;2.74(4H),m,benzylic; 2.17 (2H),m, allylic; 1.8(4H),m, ring protons, Bu^i; 5.6H(1H), NH.

Example 79 (2E,4E) N-Isobutyl 6-(indan-2-yl) hexa-2,4-dienamide

3-Benzoylpropionic acid (35.6g) was added to potassium carbonate (27.6g) in water (100 ml). After solution, 37% aqueous formaldehyde (6g) was added and the mixture stirred for 4 days. Conc. hydrochloric acid (50 ml) was added and the whole heated at 100°for 30 mins. After extraction into dichloromethane, washing with aqueous sodium carbonate and standard work-up, the crude product was purified by column chromatography (silica/ether) to yield 4-benzoyl-butyrolactone.

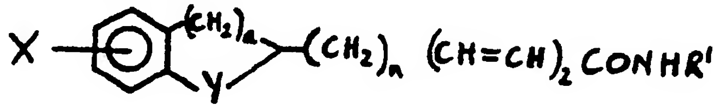
The above lactone (13g) was heated for 9 mins. at 100°with conc. sulphuric acid (70 ml). The mixture was poured onto ice and the solid product collected, dried and extracted with hot benzene. Filtration, cooling and removal of solvent from the filtrate yielded indanone acetic acid.

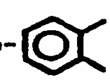
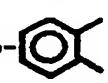
The above acid (7.1g) in glacial acetic acid (90 ml) was hydrogenated in the presence of 10% palladium on carbon (1.4g) to give indan-2-yl acetic acid.

The above acetic acid was subject to the same sequence of transformation as described in Example 69 to give ultimately (2E,4E) N-isobutyl 6-indan-2-yl) hexa-2,4-dienamide as a colourless solid.m.p. 149°. Tlc; 1 spot, R_f0.48. NMR; 7.05 (5H), m, aryl, H3; 6.05 (2H)m,H4,5; 5.80 (1H),d,H2; 5.98 (1H), NH; 3.23 (2H),d of d; 1.8(1H),m; 0.94(6H), d, isobutyl; 2.76(4H)m,benzylic; 2.36 (3H),m,allylic, $H2^i$.

Examples 78 to 89

The compounds of Examples 78 and 79, and the following compounds prepared using procedures analogous to those of Examples 78 and 79, are described in Table 2 below:



Example No.	X	Y	a	n^1	R^1	Ppd as in example
78	H	$(CH_2)_2$	1	1	isobutyl	-
79	H	CH_2	1	1	isobutyl	-
80	H	CH_2	1	1	1,2-dimethylpropyl	78
81	H	$(CH_2)_2$	1	1	2-methyl-prop-2-enyl	78
82	H	CH_2	1	1	1,2-dimethylpropyl	79
83	7-F	$(CH_2)_2$	1	1	1,2-dimethylpropyl	78
84	7-Cl	$(CH_2)_2$	1	1	isobutyl	78
85	5,6- 	$(CH_2)_2$	1	1	isobutyl	78
86	5,6- 	$(CH_2)_2$	1	1	1,2-dimethylpropyl	78
87	H	$(CH_2)_3$	0	0	isobutyl	
88	H	$(CH_2)_3$	0	0	1,2-dimethylpropyl	
89	H	$-OCH_2-$	0	4	isobutyl	

The following two compounds were also made by methods analogous to those described above: N,N-di([2-(1,3-dioxalano)]-methyl]) 6-phenyl-hexa-(2E,4E)-dienamide (Example 90) and N-methyl N-(1,2-dimethylpropyl) 6-phenylhexa-(2E,4E)-dienamide (Example 91).

Further nmr data

Example 8: mp. 136.5-137.5°; NMR :7.22 (6H), m, aryl, H3; 6.18 (2H), m, H4,5; 5.78 (1H),d, H2; 5.60 (1H), NH; 3.44 (2H),d,H6; 3.96 (1H), m, 1.64 (1H),m, 1.12(3H), d, 0.92 (6H),d,1,2-dimethylpropyl

Example 14: NMR: 7.18 (6H),m,aryl, H3; 6.12 (2H), m,H4,5; 5.82 (1H),d,H2; 5.90 (1H), NH; 2.59 (2H), t, H8; 2.16 (2H),m,H6; 1.85(3H), m, H7,1,2-dimethylpropyl; 3.98 (1H),m,1.12 (3H),d,0.92 (6H) 1,2-dimethylpropyl

Example 80: m.p. 123.5; NMR 7.02 (5H),m,aryl,H3; 6.11 (2H),m,H4,5; 5.78(1H),d,H2;
5.64 (1H),NH; 2.75 (4H),m, benzylic; 2.20 (2H), m,H6;
1.8 (3H), m, ring hydrogens; 3.96 (1H),m,1.63 (1H), 1.14(3H), d, 0.94 (6H),d; 1,2-dimethylpropyl

BIOLOGICAL EXAMPLES

A. Topical application to housefly (Musca domestica)

The compounds were administered topically to female Musca domestica in cellosolve solution, either alone or in conjunction with a synergist (6µg piperonyl butoxide). The flies were kept with sugar water and the mortality was assessed after 24 hours. The results are given in Table A (first two columns):

B. Activity against grain pests

The compounds were applied (1:5 compound:piperonyl butoxide) in acetone to grain. When dry, the grain was infested with Sitophilus granarius or Tribolium castaneum. The insect mortality was assessed after 7 days to give an LC_{50} figure in ppm. (Table A, columns 3 and 4).

C. Knockdown activity against insect

Solutions of the compounds w re made up in OPD (odourless petroleum distillate)/dichloromethane and sprayed into a Kearns and March chamber, for M. domestica, or directly onto Blattella germanica or into a wind tunnel in which Culex quinquefasciatus wer released. The time for

knockdown of 50% of the insects was measured, and the concentration (KC_{50}) required for 50% knockdown in 4 minutes was calculated. The compound was used alone against B.germanica, but 1:5 compound: piperonyl butoxide against M.domestica and C.quinqu fasciatus. The results are given in columns 5, 6 and 7 of Table A.

Table A

Example No.	M domestica		Pipette on LC_{50} (ppm)		KC_{50} (4 mins)		
	alone	+6µg PB	S.gran	T.cast	Musca	Blattella	Culex
1	≤6	≤0.6	≤50	c200	≤0.3		≤0.1
2	≤6	≤2					
3		≤0.5			≤0.3		≤0.1
4		>20					
5	≤6	≤0.6			≤1	≤0.3	≤0.3
6	≤3	≤0.75	≤50	c200			
7		≤3	≤200		≤1		
8	≤6	≤0.2	≤20	≤200	≤0.5		≤0.3
9	≤6	≤1			≤0.3	≤0.3	≤0.3
10	≤6	≤0.6	≤200	c200	≤0.3	≤0.3	≤0.3
11		≤10					
12	≤10	≤2	≤50		≤0.3	≤0.3	≤0.3
13		≤10	≤200			≤1	
14		≤6	≤50		≤1	≤0.3	≤0.3
15		>10					
16		≤6					
17		≤6					
18	≤6	≤1			≤1		≤0.3
19	≤10	≤1			≤1	≤0.1	≤0.3
20		≤5	≤50				
21		>3					
22		≤10					
23		≤1	≤50		≤1	≤0.3	≤0.3
24		≤1	≤200		≤1		≤0.3
25		≤3	≤50				

26	<20	<6				
27		<3				
28		<3				
29		c20				
30		>20				
31		<6	<200			<0.3
32	c6	<6	<200			
33		<3				
34		<2			<1	<1
35		>6	<200	c200		
36		<3				<0.3
37		>3			<0.1	<0.3
38		<3				
39		<1				
40		<3	<200		<0.1	<0.3
41		c3			<0.1	
42		<1	<200	c200		<1
43		>3				
44		<5				<1
45		<3				<1
46		c3				
47		<3				
48		<3				
49		c3				
50		c3	<200			
51		<6				
52		<3	<200			
53		<3				
54		<1				<1
55		<1	<200			
56		>3				
57		<3	<200			
58		c6				
59		>6				
60		>6	<200			
61		>3				
62		>6				
63		c6				
64		>5				

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65		<10				
66		>1				
67		>5				
68		c5				
69		>5	c200			
70		<6				
71		<10				
72		<6				
73		<6				
74		<6				
75		>0.6				
76		>3				
77		<10				
78	<6	<1	<50	<1		
79	<10	<3		<1		<1
80		<0.5		<0.3		<0.3
81		<3	<50	<1	<0.1	
82		<0.6		<1		<0.3
83	<3	<0.6				
84		<0.2	<200			
85		<3				
86		<0.2				
87		<3				
88		<6				
89		>3				

D. Acaricidal activity

The compounds were tested by injecting 10μg in cellosolve into female Boophilus microplus adults and assessing the percentage inhibition of reproduction (%IR) over 2 weeks. The results are given in Table B:

Tabl B

Compound of Example No.	% IR	Compound of Ex. No.	% IR
		42	90
		43	0
		44	40
2	20	45	100
		46	45
6	70	47	100
7	0		
8	100	49	60
		50	0
		52	100
15	20	53	100
		54	100
16	10	55	100
		56	50
18	100	57	20
19	0	58	90
20	50	59	30
21	70		
23	0	66	10
24	100		
25	10	68	0
		69	10
27	0	70	10
28	10	71	90
31	0		
32	60		
33	50		
		78	70
34	10		
		86	80
37	0	82	100

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Formulations

1. Emulsifiable Concentrate

Compound of Fxample 1	10.00
Ethylan KFO	20.00
Xylene	67.50
Butylated Hydroxyanisole	2.50
	100.00

2. Wettable Powder

Compound of Example 1	25.0
Attapulgite	69.50
Sodium isopropylbenzene sulphonate	0.50
Sodium salt of condensed naphthalene sulphonic acid	2.50
Butylated hydroxytoluene	2.50
	100.00

3. Dust

Compound of Example 1	0.50
Butylated Hydroxyanisole	0.10
Talc	99.40
	100.00

4. Bait

Compound of Example 1	40.25
Icing Sugar	99.65
Butylated hydroxy toluene	0.10
	100.00

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5. Lacquer

Compound of Example 1	2.5
Resin	5.0
Butylated Hydroxy anisole	0.5
High aromatic white spirit	92.0
	100.00

6. Aerosol

Compound of Example 1	0.30
Butylated Hydroxy anisole	0.10
1,1,1-Trichloroethane	4.00
Odourless Kerosene	15.60
Arcton 11/12. 50:50 mix	80.00
	100.00

7. Spray

Compound of Example 1	0.1
Butylated Hydroxy anisole	0.1
Xylene	10.0
Odourless Kerosene	89.8
	100.00

8. Potentiated Spray

Compound of Example 1	0.1
Permethrin	0.1
Butylated Hydroxyanisole	0.1
Xylene	10.1
Od urless Kerosene	89.8
	100.0

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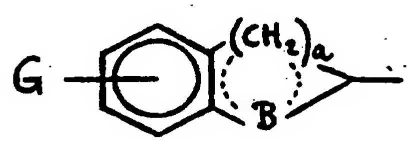
Claims for GB, CH, DE, FR, IT, LI, NL SE LU

1. A compound of Formula (I):

$$Ar\,(CH_2)_n\,(CR^2{=}CR^3)_2\,\overset{O}{\overset{\|}{C}}NRR^1 \qquad (I)$$

wherein: Ar is phenyl, naphthyl, thienyl, fluorenyl, phenanthrenyl, dibenzo furanyl or a polynuclear group (A):



in which a is 0, 1 or 2; B is $(D)_b(CH_2)_c(E)_e$ where each of D and E is oxygen or sulphur, b and e are independently 0 or 1 but not both 1, and c is 0, 1, 2 or 3, the sum of a,b,c and e being at least 2, and the ring containing B is wholly or partially saturated; and G is hydrogen or a benzene ring fused to the benzene ring of group (A);

any of the groups Ar may be substituted by one or more of C_{1-4} alkyl, halo-(C_{1-4}) alkyl, halo, C_{1-4} alkoxy (except 3,4-methylenedioxy) or C_{1-4} halo -alkoxy; n is 1 to 8, except that n is 1 to 4 when Ar is phenyl or substituted phenyl;

each of R^2 and R^3 is in each case independently hydrogen, C_{1-4} alkyl or halo-(C_{1-4})alkyl; and R and R^1 are each selected from hydrogen, C_{1-6} alkyl, C_{3-6} cycloalkyl, C_{2-6} alkenyl or C_{1-6} alkoxy (any of which may be substituted by halo, C_{2-6} alkenyl, C_{1-6} alkyl, C_{3-6} cycloalkyl, C_{1-6} alkoxy, C_{2-6} alkynyl or cyano) except that the following compounds are excluded:

N-isobutyl-6-(2-naphthyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylpropyl)-6-(2-naphthyl)-hexa-2E,4E-dienamide
N-isobutyl-6-(2-fluorenyl)-hexa-hexa-2E,4E-dienamide
N-(2,2-dimethyl-but-3-enyl)-6-(2-naphthyl)-hexa-hexa-2E,4E-dienamide
N-(2-methylbutyl)-6-(2-naphthyl)-hexa-hexa-2E,4E-dienamide
N-isobutyl-6-(2-phenanthrenyl)-hexa-2E,4E-dienamidehexa-2E,4E-dienamide
N-isobutyl-6-(5-brom -2-naphthyl)-hexa-2E,4E-dienamide
N-isobutyl-6-(6-bromo-2-naphthyl)-hexa-2E,4E-di namide
N-isobutyl-6-(2-dibenzofuranyl)-hexa-2E,4E-di namid

N-(1,2,2-trimethylpropyl)-6-(2-naphthyl)-hexa-2E,4E-dienamide
N-(1,2-dimethylpropyl)-6-(2-naphthyl)-hexa-2E,4E-dienamide
N-(2,2-dim thylpropyl)-6-(2-phenanthrenyl)-hexa-2E,4E-dienamide
N-(1,2-dimethylpropyl)-6-(2-phenanthrenyl)-h xa-2E,4E-dienamide
N-(2-methylbutyl)-6-(2-phenanthrenyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylpropyl)-6-(5-bromo-2-naphthyl)-hexa-2E,4E-dienamide
N-(2-methylbutyl)-6-(5-bromo-2-naphthyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylpropyl)-6-(2-dibenzofuranyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylbut-3-enyl)-6-(2-dibenzofuranyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylbut-3-enyl)-6-(2-phenanthrenyl)-hexa-2E,4E-dienamide
N-(1,2-dimethylpropyl)-6-(2-dibenzofuranyl)-hexa-2E, 4E-dienamide
N-(2-methylbutyl)-6-(2-dibenzofuranyl)-hexa-2E,4E-dienamide
N-(1,2-dimethylpropyl-6-(5 bromo-2-naphthyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylbut-3-enyl)-6(5-bromo-2-naphthyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylpropyl)-6-(9-bromo-3-phenanthrenyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylpropyl)-6-(5,8-dibromo-2-naphthyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylpropyl)-6-(7-bromo-2-naphthyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylpropyl)-6-(7-chloro-2-naphthyl)-hexa-2E,4E-dienamide
N-(2-methylpropyl)-6-(7-chloro-2-naphthyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylpropyl)-6-(7-fluoro-2-naphthyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylbut-3-enyl)-6-(9,10-dilydrophenanthrenyl)-hexa-2E,4E-dienamide
N-(1,2-dimethylpropyl)-6-(7-fluoro-2-naphthyl)-hexa-2E,4E-dienamide
N-isobutyl 7-phenyl hepta-(2E,4E)-dienamide
N-isobutyl 6-phenyl hexa-(2E,4E)-dienamide
N-isobutyl 6-(4-methoxyphenyl)hexa-(2E,4E)-dienamide
N-isobutyl 6-(2-thienyl)hexa-(2E,4E)-dienamide
N-isobutyl 8-phenylocta-(2E,4E)-dienamide
N-isobutyl 6-(1-naphthyl)hexa-(2E,4E)-dienamide

2. A compound of Formula (IA):

$$\text{(IA)} \quad Ar\text{-}(CH_2)_n(CR^2{=}CR^3)_2\overset{O}{\overset{\|}{C}}NRR^1$$

wherein Ar, n, R, R^1, R^2 and R^3 are as defined above except that, (i) when n is 1 and R is H and Ar is 2-fluorenyl, 2-phenanthrenyl, 2-dibenzofuranyl, 9,10-dihydro-2-phenanthrenyl, 5-, 6- or 7-halo-2-naphthyl, 5,8-dibromo-2-naphthyl or 3-(9-bromo)-phenanthrenyl then R^1 is not isobutyl, 2,2-dimethylpropyl,2,2-dimethyl-3-butenyl, 2-methylbutyl, 1,2,2-trimethylpropyl or 1,2-dimethylpropyl, and (ii) when n is 1 and R is H and Ar is 2-naphthyl then R^1 is not 2,2-dimethylpr pyl, 2,2-dimethyl-3-butenyl, 2-m thylbutyl r 1,2,2-trimethylpropyl.

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3. A compound of Formula (IB):

$$\text{(IB)} \quad Ar\text{-}(CH_2)_n(CR^2{=}CR^3)_2\overset{O}{\overset{\|}{C}}NRR^1$$

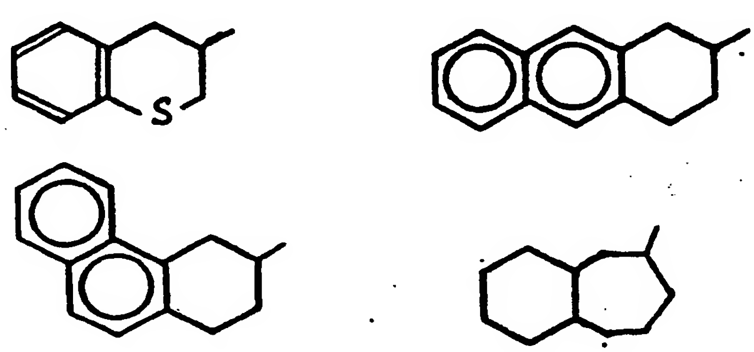
wherein Ar, n, R, R^1, R^2, and R^3 are as defined above,

except that, when n is 1 and R is H and Ar is either a polycyclic wholly aromatic ring system joined at the 2-position or 3-phenanthrenyl, then R^1 is not isobutyl, 2,2-dimethylpropyl, 2,2-dimethyl-3-butenyl, 2-methylbutyl, 1,2,2-trimethylpropyl or 1,2-dimethylpropyl, with the proviso that N-isobutyl 8-(2-naphthyl)-octa-2E,4E-dienamide and N-(1,2-dimethylpropyl)8-(2-naphthyl)-octa-2E,4E-dienamide are not excluded.

4. A compound according to any one of claims 1 to 3 wherein n is odd.

5. A compound according to any one of claims 1 to 4 wherein the configuration of both double bonds in the diene group is E.

6. A compound according to any one of claims 1 to 5 wherein Ar is phenyl, furyl, thienyl, benzofuranyl, benzopyranyl, chromanyl, indanyl, tetrahydronaphthyl, or any of the following groups:



any of which may be substituted as in claims 1 to 5.

7. A compound according to claim 6, wherein Ar is phenyl or phenyl substituted at the 3-position by halo, haloalkyl or alkoxy or Ar is 3,4-dihalophenyl.

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8. A compound according to any one of claims 1 to 5 wherein R is hydrogen and R^1 is isobutyl, 1-methylpropyl, 2,2-dim thylpropyl, 1,2,2-trimethylpropyl or 1,2-dimethylpropyl.

9. A compound according to any one of claims 1 to 6 wherein R^2 and R^3 are in each case hydrogen.

10. A process for preparing a compound according to any one of claims 1 to 9 by

(a) by reaction of a compound of Formula (II) with a compound of Formula (III):

(II) $Ar\,(CH_2)_n\,(CR^2{=}CR^3)_2\ COZ'$ (III) $HNRR^1$

wherein Z^1 is hydroxyl, halo or a phosphoroimidate ester group ($-\overset{O^-}{\overset{|}{P}}$ (O Aryl) NH aryl) and the other variables are as defined in claim 1;

(b) reaction of a compound of Formula (IV) with a compound of Formula (V) or (VI):

(IV) $Ar\,(CH_2)_n(CR^2{=}CR^3)_p\overset{O}{\overset{\|}{C}}H$

(V) $(Z'')_3\,P{=}CH(CR^2{=}CHR^3)_qC(O)NRR^1$

(VI) $(Z'')_2\underset{O^-}{\underset{|}{P}}{=}CH(CR^2{=}CR^3)_qC(O)NRR^1$

wherein Z" is alkyl, alkoxy (preferably ethoxy) or aryl (preferably phenyl), and p+q=1. The locations of the aldehyde and the phosphorus containing groups, $(Z'')_3P$ and $(Z'')_2P(O)$, may be swapped to give an exactly analogous reaction;

(c) β-elimination from a compound of Formula (VII) or (VIII):

(VII) $Ar(CH_2)_n(CR^2{=}CR^3)\,\overset{X}{C}R^2\overset{Y}{C}R^3C(O)NRR^1$

(VIII) $Ar(CH_2)_n\overset{X}{C}R^2\overset{Y}{C}R^3(CR^2{=}CR^3)C(O)NRR^1$

wherein one of X and Y is hydrogen and the other is a group Q(→O⁻)L, where Q is sulphur or selenium and L is a suitable group;

(d) reaction of a compound of Formula (IX) with a compound of Formula (X):-

(IX) $Ar(CH_2)_nCH_2\text{-}Hal$

(X) $R^2C{\equiv}CR^3(CR^2{=}CR^3)C(O)NR^1$

where Hal is a halogen atom, followed by reduction of the triple bond; or

(e) by reacting a compound of Formula (XI) with a compound of Formula (XII): -

(XI) $Ar\ (CH_2)_n\ CR^2{=}CR^3\text{-}M$

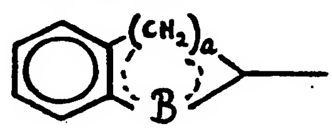
(XII) $Hal\text{-}(CR^2{=}CR^3)\overset{O}{\overset{\|}{C}}NRR^1$

wherein Hal is halide and M is a metal atom or metal group,

11. A pesticidal composition comprising a compound

$$Ar\ (CH_2)_n\ (CR^2{=}CR^3)_2\ \overset{O}{\overset{\|}{C}}NRR^1 \qquad \text{(I)}$$

wherein: Ar is phenyl, naphthyl, thienyl, fluorenyl, phenanthrenyl, dibenzofuranyl or a polynuclear group (A):



in which a is 0, 1 or 2; B is $(D)_b(CH_2)_c(E)_e$ where each of D and E is oxygen or sulphur, b and e are independently 0 or 1 but not both 1, and c is 0, 1, 2 or 3, the sum of a,b,c and e being at least 2, and the ring containing B is wholly or partially saturated; and G is hydrogen or a benzene ring fused to the benzene ring of group (A);

any of the groups Ar may be substituted by one r mor of C_{1-4} alkyl, halo-(C_{1-4}) alkyl, halo, C_{1-4} alkoxy (except 3,4-methylenedioxy) or C_{1-4} halo- -alkoxy; n is 1 to 8, except that n is 1 to 4 when Ar is phenyl or substituted phenyl;
each of R^2 and R^3 is in each case independently hydrogen, C_{1-4} alkyl or halo-

(C_{1-4})alkyl; and R and R^1 are each selected from hydrogen, alkyl, cycloalkyl, alkenyl or alkoxy (any of which may be substituted by halo, alkenyl, alkyl, cycloalkyl, alkoxy, alkynyl or cyano) except that the following compounds are excluded.

N-isobutyl-6-(2-naphthyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylpropyl)-6-(2-naphthyl)-hexa-2E,4E-dienamide
N-isobutyl-6-(2-fluorenyl)-hexa-hexa-2E,4E-dienamide
N-(2,2-dimethyl-but-3-enyl)-6-(2-naphthyl)-hexa-hexa-2E,4E-dienamide
N-(2-methylbutyl)-6-(2-naphthyl)-hexa-hexa-2E,4E-dienamide
N-isobutyl-6-(2-phenanthrenyl)-hexa-2E,4E-dienamidehexa-2E,4E-dienamide
N-isobutyl-6-(5-bromo-2-naphthyl)-hexa-2E,4E-dienamide
N-isobutyl-6-(6-bromo-2-naphthyl)-hexa-2E,4E-dienamide
N-isobutyl-6-(2-dibenzofuranyl)-hexa-2E,4E-dienamide
N-(1,2,2-trimethylpropyl)-6-(2-naphthyl)-hexa-2E,4E-dienamide
N-(1,2-dimethylpropyl)-6-(2-naphthyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylpropyl)-6-(2-phenanthrenyl)-hexa-2E,4E-dienamide
N-(1,2-dimethylpropyl)-6-(2-phenanthrenyl)-hexa-2E,4E-dienamide
N-(2-methylbutyl)-6-(2-phenanthrenyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylpropyl)-6-(5-bromo-2-naphthyl)-hexa-2E,4E-dienamide
N-(2-methylbutyl)-6-(5-bromo-2-naphthyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylpropyl)-6-(2-dibenzofuranyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylbut-3-enyl)-6-(2-dibenzofuranyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylbut-3-enyl)-6-(2-phenanthrenyl)-hexa-2E,4E-dienamide
N-(1,2-dimethylpropyl)-6-(2-dibenzofuranyl)-hexa-2E, 4E-dienamide
N-(2-methylbutyl)-6-(2-dibenzofuranyl)-hexa-2E,4E-dienamide
N-(1,2-dimethylpropyl-6-(5 bromo-2-naphthyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylbut-3-enyl)-6(5-bromo-2-naphthyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylpropyl)-6-(9-bromo-3-phenanthrenyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylpropyl)-6-(5,8-dibromo-2-naphthyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylpropyl)-6-(7-bromo-2-naphthyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylpropyl)-6-(7-chloro-2-naphthyl)-hexa-2E,4E-dienamide
N-(2-methylpropyl)-6-(7-chloro-2-naphthyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylpropyl)-6-(7-fluoro-2-naphthyl)-hexa-2E,4E-dienamide
N-(2,2-dimethylbut-3-enyl)-6-(9,10-dilydrophenanthrenyl)-hexa-2E,4E-dienamide
N-(1,2-dimethylpropyl)-6-(7-fluoro-2-naphthyl)-hexa-2E,4E-dienamide
N-isobutyl 8-ph nyl octa-(2E,4E)-di namid
N-isobutyl 6-phenyl hexa-(2E,4E)-dienamide
N-isobutyl 6 (2-thienyl)h xa (2E,4E)-dienamide
and one or mor carriers.

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12. A method of combatting pests by applying to a locus a compound according to any one of claims 1 to 9 or a compositi n according to claim 11.

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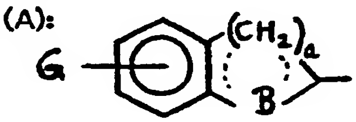
Claims for AT

1. A process for preparing a compound of Formula (I):

$$Ar\,(CH_2)_n\,(CR^2{=}CR^3)_2\,\overset{O}{\overset{\|}{C}}NRR^1 \qquad (I)$$

wherein: Ar is phenyl, naphthyl, thienyl, fluorenyl, phenanthrenyl, dibenzofuranyl or a polynuclear group (A): 

in which a is 0, 1 or 2; B is $(D)_b(CH_2)_c(E)_e$ where each of D and E is oxygen or sulphur, b and e are independently 0 or 1 but not both 1, and c is 0, 1, 2 or 3, the sum of a,b,c and e being at least 2, and the ring containing B is wholly or partially saturated; and G is hydrogen or a benzene ring fused to the benzene ring of group (A);

any of the groups Ar may be substituted by one or more of C_{1-4} alkyl, halo-(C_{1-4}) alkyl, halo, C_{1-4} alkoxy (except 3,4-methylenedioxy) or C_{1-4} halo- -alkoxy; n is 1 to 8, except that n is 1 to 4 when Ar is phenyl or substituted phenyl;

each of R^2 and R^3 is in each case independently hydrogen, C_{1-4} alkyl or halo-(C_{1-4})alkyl; and R and R^1 are each selected from hydrogen, C_{1-6} alkyl, C_{3-6} cycloalkyl, C_{2-6} alkenyl or C_{1-6} alkoxy (any of which may be substituted by halo, C_{2-6} alkenyl, C_{1-6} alkyl, C_{3-6} cycloalkyl, C_{1-6} alkoxy, C_{2-6} alkynyl or cyano), by

(a) reaction of a compound of Formula (II) with a compound of Formula (III):

(II) $Ar\,(CH_2)_n\,(CR^2{=}CR^3)_2\;COZ'$ (III) $HNRR^1$

wherein Z^1 is hydroxyl, halo or a phosphoroimidate ester group ($-\overset{O^-}{P}$ (O Aryl) NH aryl) and the other variables are as defined in claim 1;

(b) reaction of a compound of Formula (IV) with a compound of Formula (V) or (VI):

(IV) $Ar\,(CH_2)_n(CR^2{=}CR^3)_p\overset{O}{\overset{\|}{C}}H$

(V) $(Z'')_3\,P{=}CH(CR^2{=}CHR^3)_qC(O)NRR^1$

(VI) $(Z'')_2\,\underset{\displaystyle O^-}{\underset{|}{P}}\;{=}CH(CR^2{=}CR^3)_qC(O)NRR^1$

wherein Z" is alkyl, alkoxy (preferably ethoxy) or aryl (preferably phenyl), and p+q=1. The locations of the aldehyde and the phosphorus containing groups, $(Z'')_3P$ and $(Z'')_2P(O)$, may be swapped to give an exactly analogous reaction;

(c) β-elimination from a compound of Formula (VII) or (VIII):

(VII) $Ar(CH_2)_n(CR^2{=}CR^3)\overset{X}{C}R^2\overset{Y}{C}R^3C(O)NRR^1$

(VIII) $Ar(CH_2)_n\overset{X}{C}R^2\overset{Y}{C}R^3(CR^2{=}CR^3)C(O)NRR^1$

wherein one of X and Y is hydrogen and the other is a group $Q({\rightarrow}O^-)L$, where Q is sulphur or selenium and L is a suitable group;

(d) reaction of a compound of Formula (IX) with a compound of Formula (X):-

(IX) $Ar(CH_2)_nCH_2\text{-}Hal$

(X) $R^2C{\equiv}CR^3(CR^2{=}CR^3)C(O)NR^1$

where Hal is a halogen atom, followed by reduction of the triple bond; or

(e) by reacting a compound of Formula (XI) with a compound of Formula (XII):

(XI) $Ar\,(CH_2)_n\,CR^2{=}CR^3\text{-}M$

(XII) $Hal\text{-}(CR^2{=}CR^3)\overset{O}{\overset{\|}{C}}NRR^1$

wherein Hal is halide and M is a metal atom or metal group,

2. A process according to claim 1 to wherein n is odd.

3. A process according to claim 1 or 2 wherein the configuration f both double bonds in the diene group is **E**.

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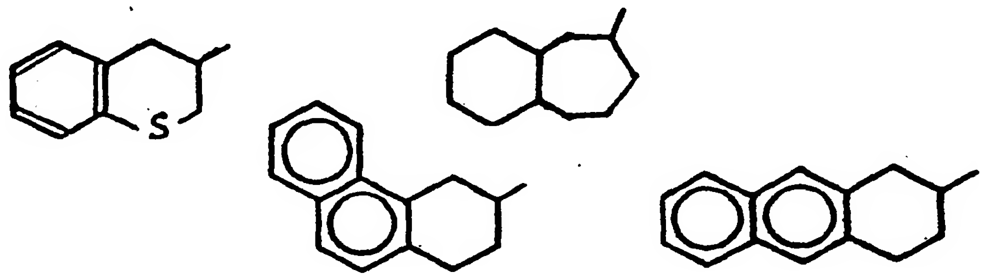
4. A process according to any one of claims 1 to 3 wherein Ar is phenyl, furyl, thienyl, naphthyl, benzofuranyl, benzopyranyl, chromanyl, indanyl, tetrahydronaphthyl, or any of the following groups:



any of which may be substituted as in claims 1 to 3.

5. A process according to claim 4 wherein Ar is phenyl or phenyl substituted at the 3-position by halo, haloalkyl or alkoxy or Ar is 3,4-dihalophenyl.

6. A process according to any one of claims 1 to 5 wherein R is hydrogen and R^1 is isobutyl, 1-methylpropyl, 2,2-dimethylpropyl, 1,2,2-trimethylpropyl or 1,2-dimethylpropyl.

7. A process according to any one of claims 1 to 6 wherein R^2 and R^3 are in each case hydrogen.

8. A pesticidal composition comprising a compound prepared according to any one of claims 1 to 7 and one or more carriers.

9. A method of combatting pests by applying to a locus a compound prepared according to any one of claims 1 to 7 or a composition according to claim 8.

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EUROPEAN SEARCH REPORT

0194764

Application numbe

EP 86 30 1074

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int Cl 4)
A	JOURNAL OF THE CHEMICAL SOCIETY, PERKIN TRANSACTION 1, 1982, pages 1493-1498, London, GB; B.G. PRING: "Isolation and identification of amides from Piper callosum. Synthesis of Pipercallosine and Pipercallosidine" * Page 1493, formulas 1,3; pages 1495,1497 * ---	1	C 07 C 103/30 C 07 D 307/79 C 07 D 333/24 C 07 D 333/60 C 07 D 317/32 C 07 D 311/74 C 07 C 121/43 A 01 N 37/18 A 01 N 45/00 A 01 N 43/12 A 01 N 43/10 A 01 N 43/28 A 01 N 43/16
A	TETRAHEDRON LETTERS, vol. 25, no. 38, 1984, pages 4267-4270, Pergamon Press Ltd., Oxford, GB; L. CROMBIE et al.: "Insecticidal amides. Synthesis of natural 2(E),4(E),10(E)-Pipercide, its 2(E),4(E),10(Z)-stereomer, and related isobutylamides" * Page 4268, formula 9 * ---	1	TECHNICAL FIELDS SEARCHED (Int Cl 4)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	29-05-1986	PAUWELS G.R.A.

CATEGORY OF CITED DOCUMENTS

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